

MEMORANDUM FOR: Dewberry & Davis LLC

FROM: Charles W. Challstrom
Director, National Geodetic Survey

SUBJECT: **UPDATED PROJECT INSTRUCTIONS:**
Evaluation of NOS NGS-58

This document contains specific instructions to accomplish the following height modernization survey:

1. Project Name: Evaluation of NOS NGS-58, 2002
2. Geographic Limits: Wake County Area, North Carolina
3. Project ID Number: GPS-1692
- 4a. Size of Project: Approximately 90 by 63 kilometers
- 4b. Number of Points: approximately 25 stations
- 4c. LIDAR Project Area: None.
- 4d. LIDAR Parameters: None.
5. Points of Contact (e-mail both):

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This Height Modernization project shall include: reconnaissance, mark recovery, mark setting, GPS observations, data processing, data analysis, data adjustment, data submittal in specified formats, and preparing reports.

I. GENERAL:

The contractor shall perform a research project to evaluate the specifications and procedures set forth in the NOS NGS-58 document, "*GUIDELINES FOR ESTABLISHING GPS-DERIVED ELLIPSOID HEIGHTS*". To do this, the contractor shall establish a test network of monumented stations, perform GPS observations, perform GPS data reductions and adjustments, and analyze the results. The contractor shall submit all data in standard bluebook format to NGS and, in addition, the contractor shall prepare a publishable document that describes the tests and analyses performed, and recommendations for changes, if any, to the specifications and procedures in NOS NGS-58.

II. PURPOSE:

This project will serve as a comprehensive evaluation of the procedures and specifications in NOS NGS-58 and will offer evidence to possibly modify these procedures. The resulting monumented network and GPS dataset will serve as test beds to evaluate new survey instruments, survey methodologies, and GPS processing methodologies.

III. PROJECT DEVELOPMENT:

- The **CONTRACTOR** will conduct field reconnaissance to recover or establish a rectangular network of at least 25 stations located in Wake County, North Carolina. The network shall be an elongated grid with at least 3 stations on one side and at least 8 stations on the other side. All stations shall be generally accessible to the public and meet stability code "B" requirements or better. Station spacing shall average 5 km and shall not exceed 7 km.
- The **CONTRACTOR** will submit a Survey Plan, in accordance with the "Scope of Work, Height Modernization and Lidar Surveys" (SOW).

IV. DATA ACQUISITION:

GPS observations shall be done in accordance with the SOW with the following exceptions:

The **CONTRACTOR** shall observe all stations simultaneously in a single session for at least 72 continuous hours, if possible. If, for security reasons, the equipment cannot be left unattended, the contractor may observe all stations simultaneously in each of four separate 12-hour sessions on four separate days.

The **CONTRACTOR** shall use three discrete GPS receiver/antenna combinations. The like receiver/antenna types shall be deployed such that they will be adjacent to each other in a linear fashion. For example: all GPS receiver/antennas of type "A" shall be deployed on the northernmost stations, while type "B" shall be deployed on the southernmost stations, and type "C" shall be deployed on all stations in between.

The **CONTRACTOR** shall collect meteorological data at each of the four corner stations of the project. The barometers shall be accurate to 1 mb.

V. DATA PROCESSING:

All GPS data processing, adjustments, and reports shall be done in accordance with the SOW. The final bluebook to be submitted to NGS will include all data collected.

VI. DATA ANALYSES AND EVALUATION OF NOS NGS-58:

The **CONTRACTOR** will reprocess and analyze the GPS dataset as follows:

1. Reprocess discrete samples of the GPS dataset simulating the specifications and procedures in NOS NGS-58, i.e., a subset of the data will be extracted and processed separately that simulates a survey project designed to follow NOS NGS-58 procedures. Each simulated observing session shall include 30 minutes of data, and each station shall be included in at least two simulated sessions.
2. Conduct further analyses by reprocessing with variations in the NOS NGS-58 station spacing (5 km, 10 km, 15 km) and occupation times (10, 15, 20, 25, 60, 90, 120 minutes). Compare all computed positions with those developed from PAGES processing of the entire dataset.
3. In consultation with NGS, recommend additional tests and analyses and, if approved, perform these tests.
4. In cooperation with NGS, prepare a joint report, publishable in a scientific journal, discussing the validity of the NOS NGS-58 procedures, and make recommendations for additional analysis, changes, and improvements to NOS NGS-58.

VII. DATA TRANSMITTAL:

The **CONTRACTOR** will furnish all project deliverables to NGS within 3 months from the final date of observations.

VIII. ADDENDUM:

Deviations from this SOW include the following:

- Use CD-ROMs instead of Zip disks for submitting data.
- Use ITRF2000 coordinates for all vector processing. If ITRF2000 coordinates are not available for the reference stations, transform from NAD83 with NGS program HTDP.
- No CTCORS stations will be needed or required.
- All tripods shall be tested for stability, plumb alignment

(straightness of center pole), and height verification at the beginning and end of the project. All tripods shall be examined for stability with each use. Ensure that hinges, clamps, and feet are secure and in good repair. Also, check the position of the bubble in the circular vial.

- Use the U.S. Survey foot (3.28083333333 feet = 1 meter) for any length conversions.
- The Contractor shall submit to NGS the initial minimally constrained adjustment before continuing with additional data processing. NGS will review and comment on this adjustment as soon as possible, normally within 5 working days.
- **The Contractor shall have a registered North Carolina Surveyor oversee all work done in this state. Please see <http://www.ncbels.org/> for further information.**

Enclosed are the government-supplied materials listed in the SOW, Section 3 plus a list and map of existing stations taken from the NGS Database on 5/1/02 in ArcExplorer Format.